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ABSTRACT

This document explains the British Industrial Training Research Unit's CRAMP (Comprehension, Reflex action, Appropriate attitude, Memorizing, Procedural learning) system for designing training. The first section introduces the CRAMP approach and includes an exercise (and answers) to measure whether the reader understands CRAMP's definitions of learning types. The second section, in workbook format, presents the areas that must be decided before choosing which training methods to use in a training program. Those areas are: (1) deciding whether training is needed; (2) analyzing the job; (3) identifying learning outcomes; (4) identifying what trainees need to learn; and (5) considering constraints and the needs of trainees. Section 3 leads the reader through the selection of training approaches by describing nine approaches (presentation, presentation-discussion, group discussion-task, project group work, team training, discovery learning, open learning, pair or one-to-one discussion, and computer-based training) that are categorized as either exposition or instructor-led, collaborative or group-centered, and individual. Each description includes characteristics of the approach, associated training methods, type of learning for which the approach is appropriate, trainee needs that are usually met and unmet by this approach, and suggested references. Section 4 leads the reader through the selection of training methods by describing 29 training methods and 3 ways of learning procedures. Included in the descriptions are characteristics of the methods, the kind of learning for with each is appropriate, and 15 suggested readings. (CML)

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CRAMP

A guide to training decisions

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Introduction to CRAMP

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Part I
Introduction to CRAMP

Learning and CRAMP

Learning is "a change in disposition or capability which is not simply ascribable to processes of growth". (Gagné 1977)

The CRAMP approach to learning identifies five types of learning:

C Comprehension
R Reflex action
A Appropriate attitude
M Memorising
P Procedural learning

The CRAMP system itself, described in this pack, is a practical instrument for selecting the type of training which is appropriate for the kind(s) of learning central to the task. By using the most appropriate type of training, learning is speeded up and the required level of competence in the task is acquired more quickly.

Contents of the CRAMP package.

The CRAMP package is divided into four parts:

Part I – Introduction

Part II – The CRAMP workbook. This asks a number of questions which will help you to analyse the task, state learning objectives, identify the types of learning involved and select an appropriate training approach and training method.

Part III – A description of training approaches which are chosen according to the needs and preferences of the learners.
This is a reference section.

Part IV – A description of training methods selected according to the nature of the task to be learned.
This also is a reference section.

Becoming familiar with the CRAMP approach.

This package does not present the theory of learning upon which CRAMP is based. Rather than to learn a theory it is important to become accustomed to the definition of each type of learning and to classifying tasks according to the type of learning involved. On the next page are the five definitions. Once you have mastered these, do the CRAMP definition exercise.

Types of Learning

C	**Comprehension**	Comprehension in a task refers to understanding the subject-matter; knowing how, why or when things happen: e.g. knowing how to price articles in a shop.
R	**Reflex Action**	Reflex actions in a job are skilled physical movements and fine perceptual capacities developed over a period of time: e.g. operating a till quickly and efficiently.
A	**Appropriate attitudes**	These are expressed in relationships with other people and in behaviour appropriate to the job or task: e.g. showing courtesy to a customer even if the sales assistant feels he or she is being unreasonable. Attitude development is often carried out to help employees to adjust to change, as when, for example, restructuring requires managers to change their accustomed work responsibilities.
M	**Memorising**	Remembering information required to carry out a specific job efficiently: e.g. product prices; stock location; job numbers.
P	**Procedures**	Procedures organise activities or tasks into a set or preferred sequence of action. Job aids, checklists, etc., can be used by the employee without decreasing performance levels. Learning procedures usually involves one or more of the other types of learning, especially a willingness to follow the routine (attitude).

The CRAMP definition exercise

The following are descriptions of tasks to be done in different jobs. Use the CRAMP framework to identify which competences are required to carry out the task. If you think more than one is needed, underline the one which you think is *most* important.

C = Comprehension
R = Reflex action
A = Appropriate attitude
M = Memorising
P = Procedures

1. Entering information in a goods received book .....
2. Describing the organisation structure .....
3. Dealing with an irate employee .....
4. Operating a guillotine safely .....
5. Completing an expense claim form .....
6. Typing a letter .....
7. Driving a fork lift truck .....
8. Writing a shift report .....
9. Finding your pen .....
10. Loading stationery into a computer printer .....
11. Starting up a wordprocessor programme .....
12. Giving directions for finding an office .....
13. Interpreting a cost statement .....
14. Drilling a hole in a wall for a shelf fitting .....

CRAMP Exercise – Suggested Answers

Statement No.	Answer	Comments
1.	**P**	Easy to follow but important. Not a fact.
2.	**M C**	Remembering an organisation chart. Also understanding how job-positions relate formally to each other (especially if there isn't a chart).
3.	**A C (P)**	A relationship issue: in some circumstances a specific procedure may have to be followed.
4.	**R A**	Though essentially a reflex action, safe behaviour (attitude) is critical.
5.	**P C**	A procedure – the degree of understanding (comprehension) may depend on how much you want to claim!
6.	**R P (C) (A)**	Reflex action most important. Most letter typing involves a standard layout (P). C & A may be important depending on the significance of the actual letter.
7.	**R A**	Driving involves many reflex actions. Attitude refers to safety.
8.	**C (P)**	Understanding what the next shift supervisor needs to know. May be a set format.
9.	**M**	Remembering where you left it!
10.	**P**	Straightforward procedure – you could refer to instructions if in difficulty.
11.	**P**	As above
12.	**C M**	The route may have to be memorised: the process of communicating this information requires an understanding of how to present it intelligibly.
13.	**C P**	Understanding what it means. Perhaps following a routine e.g. the order in which you look at the figures.
14.	**R A (C)**	Using a drill – a skilled movement. Safety – attitude. Understanding the possible hazards (e.g. a hidden wire).

Using CRAMP

Where does CRAMP fit in training design?

Identifying training approaches and methods are the last two stages of preparation before the design of the training programme is finalised. Before you reach these stages several issues have to be considered. The CRAMP workbook, Part II, presents the issues in sequence. It is useful to consider all of them before you finalise the programme. The main issues are:

(1) Is training needed?
(2) Analysing the job
(3) Identifying learning outcomes
(4) Identifying what the trainee needs to learn
(5) Considering the constraints (of time, place, etc) and the needs of the trainees. These must be taken into account in the process of training design if training is to produce acceptable results.

Having considered these issues in relation to your specific circumstances, you are then in a position to select

(1) Training approaches
(2) Training methods

Training approaches Part III

A training approach is chosen by thinking about what trainee needs have to be met, and what constraints exist. These may range from limited training facilities to expectations about training held by the organisation.

In Part III, 9 training approaches are described. These are categorised as

Expository or instructor-centred
Collaborative or group-centred
Individual.

Each description includes:

1. Characteristics of the training approach
2. Training methods which can be used with the training approach
3. CRAMP methods of learning for which the approach is usually appropriate
4. Trainees and trainers needs which can be met
5. Trainees and trainers needs which are usually not met
6. Any special issues to consider
7. Further reading.

At this point you must use your own judgement to decide which of the training approaches described in Part III are appropriate. The CRAMP system of types of learning can only assist you: it cannot replace your expertise.

Training methods Part IV

Next you select the training methods, using Part IV as a reference. A training method is selected by considering what types of learning are involved in the task to be learned.

In Part IV, 29 training methods and 3 ways of learning procedures are described.

Each description includes:

1. Characteristics of the training method
2. CRAMP types of learning for which it is relevant (but these also depend on the nature of the task)
3. Notes on using the method
4. Further reading.

Part III, Training Approaches, and Part IV, Training Methods, are both intended for use as reference booklets.

The CRAMP workbook

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Using the workbook

To use CRAMP effectively you need first to consider several issues relevant to training design.

This workbook presents the issues as questions for you to answer, and suggests the best way of working out an answer to the question.

Each page tackles one issue. On the left are questions and activities. On the right are spaces for you to put down what you find out, what decisions you make, and anything else you feel is relevant.

Sections

1. Is Training needed?
2. Before using CRAMP – analyse the job
3. Work out what has to be learned
4. What trainees need to learn
5. Using CRAMP – tasks and types of learning
6. Choosing a training approach

Is Training Needed?

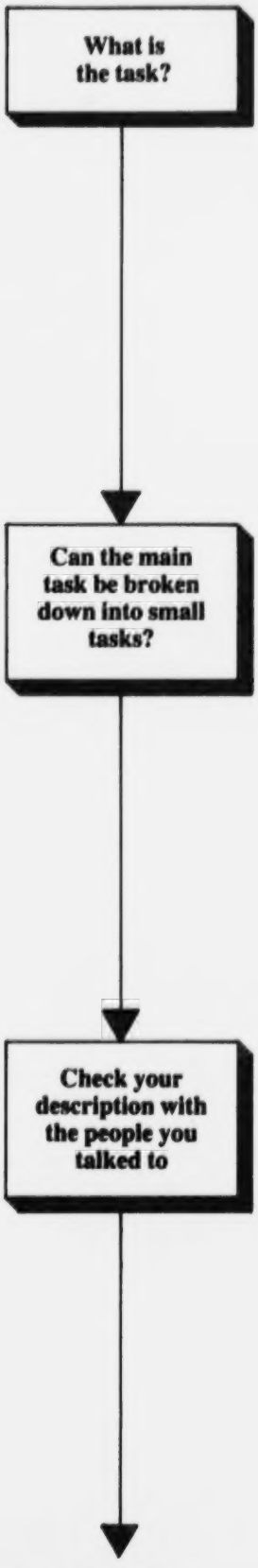
After discussion with the manager, supervisor, job holder, write down what training needs people state.

Write down who they say needs training. Do you agree?

Write down why training is needed. Do you agree? Will training improve performance significantly or marginally? Is this training a high priority?

If you conclude that training is needed and that it can significantly improve performance, turn over . . .

Before using CRAMP – Analyse the job



What is the task?

After discussion with the supervisor and other job-holders, write down in detail what the task(s) are.
Include: what has to be remembered,
what has to be understood,
what has to be done.

Can the main task be broken down into small tasks?

Now break down the main tasks into smaller parts, according to
what has to be remembered,
what has to be understood and
what has to be done

Check your description with the people you talked to

That was **TASK ANALYSIS**

Do people who know the job agree with your analysis? If they do, turn over . . .

Then work out what has to be learned

What will the trainees be able to do after training that they cannot do now?

Write down what their manager or supervisor wants them to do.

Also write down what the training will achieve.
Are they the same?

What will change perceptibly in the trainees' performance?

Write down what will change perceptibly in the trainees' performance.

Use measures such as quantity, time, cost, standard.

This tells you how you will know that the training has had some effect – the training can then be evaluated.

You have now stated the LEARNING OUTCOME and how to EVALUATE IT

Once you are happy that people other than yourself will be able to measure the result of training, turn over . . .

What trainees need to learn

Are the trainees (a) learning new skills or (b) improving existing skills?

If the skills are entirely new to them you will need to instruct them in the whole task. Turn (a) to the next page . . .

(b) If the trainees already have some level of skill or ability, training will be more effective if you take this into account, rather than starting from scratch. Observe the trainees on the job or at the start of training. You will then know what individuals need help to learn. Write it down.

Are there any particular areas of difficulty?

After discussion with the trainee and supervisor, write down what they think is wrong and why. Do you agree?

Work out what the problem is – perhaps using the critical incident technique

The critical incident technique is a way of probing general statements like "He never makes a sale" to find out exactly what the individual does or doesn't do. Considering what the trainee and the supervisor say in this way will help you to assess where any problems lie.

What needs improving

Rather than talk of overall performance improvement, consider which of the specific learning outcomes (identified on the previous page) the trainee needs to improve. Write them down. An example from learning to use a type-writer would be: The trainee must ensure (s)he strikes 'r' and 't' accurately by using the same finger.

Also consider TRAINEE NEEDS in general – these may be constraints on your choice of training approach.

1. Who are the learners?

2. What distraction and pressures from outside the learning environment are they likely to experience?

3. What training activities will seem most relevant to their work and life?

4. What sort of information and experience will they be able to offer as a learning resource?

5. Are any 'set' attitudes or patterns of behaviour likely to be displayed?

6. What are the likely expectations about learning brought from previous school and training experiences?

7. What are their preferences about trainee-centred groups or self-directed learning?

8. Are any specific anxieties held by individuals in the group? (e.g. fear of maths, loss of status)

9. What general anxieties (e.g. ability to learn, ridicule etc) are likely?

The training approach you choose must meet the needs you have summarised here.

Using CRAMP – tasks and types of learning

What does the trainee need to improve?

Use the list of tasks or parts of tasks you wrote on page 10.

What type of learning is involved in each part of the task?

Answer the five questions below in relation to each item. Write down next to each item which of the CRAMP types of learning (see introduction for a definition) are relevant.

C Does the trainee need to develop understanding? C

R Does the trainee need to produce fast, reliable responses or movements? R

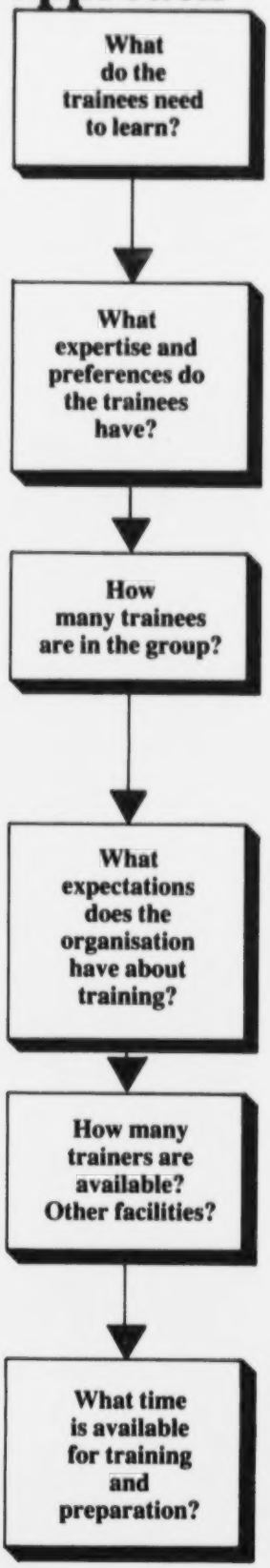
A Does the trainee need to change an attitude or develop a new approach? A

M Does the trainee need to remember facts, figures or sequences? M

P Does the trainee need to use procedures which must be followed precisely? P

If you have listed one or more of the CRAMP types of learning next to each task, you can choose suitable training approaches and methods (parts III and IV). If you had difficulty in identifying the type of learning, try breaking the task items down further.

Factors influencing choice of training approach


What do the trainees need to learn?
What expertise and preferences do the trainees have?
How many trainees are in the group?
What expectations does the organisation have about training?
How many trainers are available? Other facilities?
What time is available for training and preparation?

Some or all of these factors may be relevant to you. See pages 12–13.

See page 13.

For example are seminars, projects or external courses the norm for training within the organisation?

Part III, Training Approaches, lists characteristics which are relevant to these questions. Having decided which of the factors on this page are relevant to your training design, consult part III to identify which training approaches are most appropriate.

Factors influencing choice of training method

Which CRAMP types of learning are involved in the task(s)?

See page 14.

Which training approaches are to be used for this group of trainees?

In theory all training approaches can be used with all training methods. However, Part IV, Training Methods, suggests that some training methods are more appropriate for one type of learning than another. Choose the training methods by checking which training approaches are suggested for use with the method – and select the combination which best suits your trainees and the task.

Training approaches

Training approaches – Taking account of the needs of the learners

Expository approaches – Presentation

Presentation	Giving information, facts or procedures by a straight talk or exposition with little participation from trainees except for taking notes and asking occasional questions. May use aids such as slides, OHP, handouts, samples etc.
Training methods often used (See Part IV for definition)	Textbook, manual, handout Mnemonics, jingles Basic concepts, basic skills, Case studies Discrimination method, cueing and fading, magnification method, simulation, progressive-part method, cumulative part method, rules Video, audio-tape, lecture, simple instructions
Usual types of learning	Comprehension
Needs met – if trainer is skilled	1. Trainer's needs are met. Method is cheap and flexible. 2. Relatively little preparation or experience of subject required. 3. Room and equipment readily available. 4. Efficient way of providing information when trainees are familiar with subject. 5. May be expected and preferred learning approach of people with background in higher education. 6. Does not expose trainees.
Needs not met	1. Does not involve trainee who is easily distracted by outside pressures. 2. Approach seems distant from work and life. 3. Does not use trainees' experience as a learning resource. 4. Allows trainees to maintain old attitudes and behaviour. 5. May be associated with experience of past education – inadequacy or boredom. 6. Most of the information is forgotten quickly. 7. Individual and group anxieties unlikely to be allayed.
Further reading:	See lectures method, training method 2.

Expository approaches – Presentation/discussion (also Collaborative)

Presentation/ discussion	A structured presentation by the instructor of member of the group, followed by a discussion. The limits of the discussion are clearly defined and the instructor plans and guides it so that all important topics are covered in a way that is useful to the trainees.
Training methods often used	Textbook, manual, handout, Basic concepts, basic skills, Case studies, Intray exercise. Discrimination method, cueing and fading, Magnification method, Simulation method, Progressive and Cumulative part methods. Role play.
Usual types of learning	Comprehension Appropriate Attitude
Needs met – if instructor is skilled	1. Trainer's needs are met. Method is cheap and flexible. 2. Comparatively easy to prepare. Little prior knowledge of subject required. 3. Can be challenging, provoking and involve trainees. 4. Can use trainees' experience as a resource. 5. Can allow trainees' expectations and attitudes to be expressed and attended to.
Needs not met	1. Trainees of poor verbal ability or those who are quiet may be handicapped. 2. May involve only a small number of the group. 3. If the trainer's presentation is too expository, the needs of the trainees may not be met. 4. An expository presentation and abstract discussion may not appear relevant to the trainees' tasks.

Further reading:

Barber, J. W. (1968) Discussion leading and group training trends, Chapter 17 in J. W. Barber (Ed). Industrial Training Handbook. London, Iliffe

Collaborative approaches – Group discussion/task

Group discussion	A group, controlled by the group members and not by the trainer, debates a topic or performs a task.
Training methods often used	Basic concepts, basic skills, Case studies, In-tray, Simulation and games Discrimination, magnification, simulation methods Cumulative and Progressive part methods, cueing and fading Coverdale, Adventure training T-group, Encounter group, Interactive skills analysis Role play, Team skills, Synectics
Usual types of learning	Comprehension Reflex action (possibly) Attitude Sometimes memorising
Needs met – if group is skilled	1. Small groups involve all members (usually). 2. Can use learners as resource. 3. Encourages trainees to question and make suggestions about learning material and objectives, and to evaluate their own learning i.e. autonomy. 4. Enables 'set' attitudes and behaviours to be displayed and evaluated by individual. 5. Does not favour one type of educational background 6. Allows anxieties, specific and general, to be expressed and dealt with. 7. Effective both when subject is well-defined and technical and when subject is more experimental.
Needs not met	1. Depending on training method employed, may or may not seem relevant to work. 2. May not match trainees' expectations about learning, and require prior attitude training. 3. Group members may not have the skills to meet the needs of others. They require training in: helping others to participate, sensitivity to group process, discussion, leadership. 4. Trainees may be anxious about loss of guidance and support from the instructor. 5. Trainers may fear loss of authority, loss of job. 6. Trainers and trainees may see informal sessions as opposing the formal learning process.
Additional comments	Preliminary attitude and skill training for trainees and trainers is often required. The degree of autonomy appropriate to the learners must be considered carefully. Future expectations about training may be radically altered by this approach.

Further reading:
Abercrombie, M. L. H. (1969). The Anatomy of Judgement: Investigation into the processes of Perception and Reasoning. Harmondsworth: Penguin

Abercrombie, M. L. H. and Terry, P. M. (1974). Aims and Techniques of group teaching. Society for research into higher education.

Collaborative approaches – Project group work

Project group work	Imsie (1968) identified four types of project group. 1. Projects based on the trainees past experience in their own firm. 2. Projects requiring original work. 3. Projects in which trainees go to a new firm to tackle a specified problem. 4. Project reports based on discussions with other trainees.
Training methods often used	Basic concepts, basic skills Case studies, Simulation and games Coverdale, Adventure training Team skills, Interactive skills analysis
Usual types of learning	Attitude Comprehension
Needs met – if group is skilled	1. Usually involves all trainees actively. 2. Unfamiliar environment may lessen interference of normal distractions (depending on method). 3. Opportunity to work on real problems, present or past, makes training seem relevant and uses trainees as resource. 4. Need to accomplish group task is likely to bring out set attitudes and behaviour. 5. Sense of achievement if goal is achieved. 6. Autonomy. Group can evaluate own performance and consequences of decisions.
Needs not met	1. Groups often require preliminary training to collaborate effectively – helping skills, discussion leadership and participation, planning, evaluation etc. This may need a different training approach. 2. Anxieties e.g. incompetence, loss of status may be dealt with inadequately by group members.
Additional comments	Traditionally the project group approach has been used with managers and potential management trainees. It can be used equally successfully with more junior employees – e.g. supervisors, quality circles. The aim of project groups is often to develop new attitudes. This can be disturbing for individuals. Any group exercises must be observed and evaluated carefully and should never be used indiscriminately.

Further reading:

Imsie, J. (1968). The Project Method. Chapter 14 in J. W. Barber (Ed). Industrial Training Handbook. London: Illiffe

Collaborative approaches – Team training

Team training	Designed to help the trainees to recognise the role and contribution of the individual to the team. From an understanding of their own actions/contribution, an appreciation of the differing but effective approaches of other team members is gained.
Training methods often used	Coverdale, Adventure Training, T-group, Encounter group Team skills, Interactive skills analysis, Role play, many other commercial programmes.
Usual types of learning	Attitude Comprehension
Needs met	1. Trainees are often taken to a centre different from their normal working environment, and often away from the usual training school. This reduces the outside distractions. 2. The training activities may be like their normal work (e.g. discussion groups) but are usually very different and may be seen as irrelevant. 3. The environment away from the organisation encourages the examination of attitudes and behaviour, and experimentation with new approaches. 4. Because the nature of the training, often posing challenges, is different from expectations, many of the common general and specific anxieties will be quickly dispersed.
Needs not met	1. The training activities may not seem relevant to the trainees work and lives. 2. The trainees' previous experience may not be used, or the previous experience of some may make others feel at a disadvantage.

Further reading:

Blake and Mouton: Productivity, the human side: a social dynamics approach, NY.NY: AMACOM 1981

Individual approaches – Discovery learning (also Collaborative)

Discovery learning	Unlike traditional expository training, the instructor's verbal instruction or demonstration is not the source of the trainees' understanding. A sequence of graded problems designed to suit the trainees' knowledge and ability enables them to develop for themselves an understanding of the subject. All the information required for solving the problem is in the situation and the instructor does not give extensive help. Exposition, if any, comes at the end of training.
Training methods often used	Basic concepts, basic skills Case studies Socratic tutorial, computer simulation, simulators Simulation exercises (practical) Role play. Possibly T-group, Encounter group, rules, deductive method, flowcharts
Usual types of learning	Comprehension Attitude Reflex
Needs met – if instructor is trained in design	1. Involves learner actively. 2. Activities relevant to job can be used for training (depending on training method). 3. Can use and build on what trainees already know or teach trainees with no knowledge of subject. 4. Promotes problem-solving approach applicable at all levels of learning and for all educational backgrounds. 5. High degree of transfer to new situations. 6. Encourages self-reliance and initiative – autonomy.
Needs not met	1. May not allow learner to display and evaluate own attitudes (depending on training method and design). 2. May give too much autonomy to learners who lack confidence and want guidance and support. 3. As an approach used for attitude training it may be seen as manipulative and prejudice future expectations about training. 4. A lengthy process which can be costly because of time taken off the job. 5. New training material needs to be designed for each task – expensive and time consuming, especially if training needs change often. 6. Effect of improved learning tends to appear in the long term so short term needs are not necessarily met. 7. Trainers may feel threatened and fear loss of job etc.
Additional comments	The debate about the value of discovery learning has not ended. Some of the points for and against have been mentioned above. Perhaps the most practical position is taken by Gagné: 'The employment of a high degree of guidance, verbal or otherwise, seems to be a necessity for efficient learning'. Success in discovery learning depends on how well the progression of problems which the trainee has to solve is designed.

Further reading:

Gagné, R. and Briggs, L. J. (1979). Principles of Instructional Design. NY: Holt, Richard and Winston

Belbin, R. M. (1969). The Discovery Method in Training. TIP5: London HMSO

Chambers, D. W. (1971). Putting down the discovery learning hypothesis. Educational Technology, March pp. 54–59

Shulman, L. S. and Keisler, G. R. (Eds) (1966). Learning by Discovery: a critical appraisal. Chicago: Rand McNally

Ausubel, D. P. (1963). The Psychology of Meaningful Verbal Learning. New York: Grure and Stratton

Morris and Keeton (Eds) (1980). Defining and assuming quality in experimental learning.

Training Method 12. – Individual project

Project	A programme of work which explores a topic or problem. This may be chosen by the trainee. The trainer acts as advisor rather than teacher.
Usual types of learning	Comprehension
Advantages	1. Trainee can study the problem or subject in detail. 2. Project work is flexible and allows for different rates of trainee progress. 3. Encourages originality. 4. Encourages trainee to gather information from several sources. 5. Can develop skills for independent study.
Disadvantages	1. Trainees may find individual learning difficult and may need trainer or group support to see the project through. 2. Some guidance in individual study skills is required.

Further reading:

Garrett, R. (1971). 'Project Based Education and Development' in Management Education and Development, vol. 2, no 1, pp. 40–49

Individual approaches – Open learning

Open Learning	Self-directed learning which may be linked with an institution (e.g. Open University) or involve personal learning projects with limited tutorial support.
Training methods often used	Textbooks, manuals, computer software Basic concepts, basic skills, case studies, in-tray Drill and practice, self-testing, CBT tutorial Discrimination methods, cueing and fading, magnification, simulation, progressive part and cumulative part, rules, deductive method
Usual types of learning	Comprehension Memorising Reflex
Needs met	1. Learners can select training activities relevant to their work and experience. 2. Learners use their own experience as a resource. 3. Autonomous – can learn initiative and independence. 4. Avoids anxieties about exposure to peers etc. 5. Personal achievement and satisfaction in reaching goal. 6. Transfer of skills acquired (e.g. self-motivation, evaluation of progress etc) to job is likely. 7. Learners can progress at their own pace.
Needs not met	1. Many distractions and pressures from outside the learning environment. 2. Learner may avoid learning which produces change in attitude, behaviour etc. 3. May find it difficult to overcome doubt of ability to learn, specific personal blocks to learning. 4. May find self-directed learning skills difficult to acquire without help: i.e. * planning skills (what, how, when and where to learn) * setting realistic goals * finding learning resources and materials * evaluating progress

Further reading:

Smith, R. M. (1982). Learning how to learn: applied theory for adults. Chicago: Follet Pub. Co.

Shank, James H. (1982). Working in teams: a practical manual for improving work groups. NY.NY: AMACOM

Training method 13. – In-Tray exercise

In-tray exercise	An in-tray representative of the job is presented to the trainee. In contains documents, letters, reports, notes of meetings etc, most of which require some action to be taken. The exercise is designed to develop (or test) the ability to set priorities, to plan and foresee consquences of decisions, to write reports etc, depending on the contents of the in-tray. A time limit is often set which forces decisions on what to attend to in the time available.
Usual types of learning	Comprehension Attitude
Advantages	1. Realistic for jobs which have in-trays. 2. Can be used as an exercise following discussion about priorities, planning etc rather than as a test. Performance usually improves under these circumstances. 3. Involves the trainee.
Disadvantages	1. If used as a test, trainee's level of anxiety is likely to inhibit learning. 2. The method tends to be used as a high-pressure exercise. Identification of the skills required to deal with the problems effectively, or those which are to be taught, is often sketchy.

Further reading:

Zoll, A. A. (1969). Dynamic Management Education, Reading, Mass: Addison-Wesley ch 9 and 10

Individual approaches – Pair or one-to- one discussion

Pair or one-to-one discussion	A one to one discussion or tutorial is used to convey information, ideas and opinions, usually by the discussion of a concept or procedure between the instructor and the learner. It may be based on a written essay or other piece of work
Training methods often used	Textbooks Basic concepts, basic skills Case studies Individual projects, reports, essays etc
Usual types of learning	Comprehension
Needs met	1. Learner is involved actively. 2. Instruction can be individualised to suit learner's previous education and experience, needs, preferences and learning style. 3. Specific and general anxieties can be dealt with. 4. Specific questions, problems etc can be discussed fully.
Needs not met	1. Approach may not seem relevant to learner's work and experience. 2. Learner may be the target of a one-way lecture. 3. Learner may experience high anxiety because not supported by other learners. 4. Possible clash of personalities and differing expectations, attitudes and behaviours of learner and trainer may inhibit learning.

Further reading:

Wood, A. E. (1979). Experiences with small group tutorials, in Studies in Higher Education Vol. 4 No. 2 pp. 203–9

Training method 14. – Textbook, manual, handout

Textbook	Textbooks, manuals and handouts can be used with any training approach, although they are most often associated with the presentation and demonstration approach. Their function is usually to provide additional or background information, and often to repeat or anticipate the content of the training programme.
Usual types of learning	Comprehension Memorising
Advantages	1. Trainees can go at their own speed. 2. Trainees can refer back to the text. 3. Learning does not depend on the trainee's ability to take notes. 4. A large amount of information can be presented. 5. After the initial purchase the cost is low.
Disadvantages	1. Trainees are likely to associate textbooks with school education. 2. Choosing textbooks of the appropriate standard and content is a skilled job. 3. Content is divorced from 'real life'. 4. Trainees may have difficulty in reading text or interpreting diagrams, pictures, graphs etc.

Further reading:

Bibiography of available textbooks published by BACIE

Selecting instructional materials (1978). Woodbury Marda, Bloomington Phi Delta Kappa Educational Foundation

Individual approaches – Computer-based training

Computer-based training (CBT)	The use of computers to train individuals with or without the aid of a trainer. Computer-Based Training encompasses both Computer Assisted Instruction and Computer Assisted Learning.
Computer assisted instruction (CAI)	The computer is seen as a medium for instruction like a text book or video (i.e. a training *method* and the main problem is how to present instructional materials most effectively.)
Computer assisted learning (CAL)	The computer is seen as a tool like a calculator and the main problem is how to teach learners to use their computer to enhance their learning.
Training methods often used	Basic concepts, computer based drill and practice, tutorials, socratic tutorials, testing, games, simulations, programming, database enquiry. Many other training methods can be adapted.
Usual types of learning	Comprehension Memorising
Needs met	1. Trainers needs are met through increased control and standardisation of learning. 2. Reduced need for central training facilities, actual equipment (because of simulation and graphics). 3. If computer is on site, learning can take place in quiet periods on the job. 4. Simulations and other training activities can be relevant to work. 5. Computer based training can teach trainees the computer system used on the job. 6. Individualised instruction – CBT can be self-paced, assess level of entry; sequence instruction according to progress; provide remedial instruction. Some programmes enable learners to develop own learning strategies. 7. Reduces training time by about 30% because of individualised instruction. Improves job performance. 8. Learner satisfaction due to personal involvement, individual feedback, capacity to assess own progress. 9. Can resist outside distractions by being visually stimulating, varied.
Needs not met	1. On-site training means that learning may take second place to job. 2. Depending on method employed, learner may not need to recognise and evaluate own attitudes and behaviour as required in a group. 3. CBT cannot yet take individual learning styles into account whereas a skilled instructor can. 4. CBT cannot yet diagnose learning problems with any degree of sophistication. 5. CBT cannot yet use training methods such as role play.
Additional comments	Like all training approaches, CBT is only as good as the initial task and competence analysis allows it to be.

The role of the instructor will change and retraining will be required.

Hardware is not yet universally available and older models of computer can be difficult to use.

Courseware development currently takes several months and the skills required i.e. instructional design and programming skills are in short supply. The increase in tested software training packages compatible with most micros will reduce this problem as will the emergence of powerful authoring systems which will enable the trainer to write material without programming skills.

Once these are available revision of material will be much easier and cheaper than the present manual rewriting of course work.

Other future developments with implications for training are:

1. Interactive videodisc and multi-media presentation (for roleplay, personal skills)
2. Portable and handheld computers
3. Speech generation, synthesis and recognition
4. Intelligent tutoring systems capable of assessing learning style and diagnosing learning problems.

Further reading:

Morris, R. (1981). Computer Based Learning Systems' in Training vol. 7, No. 1 pp. 2–7.

Tawney, D. A. (1979). ed. Learning through computers. London: Macmillan

Training methods

A training method takes into account the type of learning involved in the task. A number of training methods are described in this section. As far as possible, each page outlines what each training method is, how it can be used, any specific application to a task and suggests further reading.

Training method 1.
– Basic concepts, Basic skills

Basic concepts	A method which can be used with any approach and in combination with most training methods. It assumes that understanding of basic principles will help the trainee to learn the detail more easily.
Basic skills or simplified tasks	Can also be used with any training approach and most other training methods. It reduces difficult tasks to their easiest possible form while retaining their basic features.
Usual types of learning	Comprehension Attitude Memorising Reflex
Using the basic concepts and skills methods	1. Analyse the task or topic in order to identify the basic features. 2. Eliminate all irrelevant detail from the early stages of training. To teach early stages use any method appropriate to the type of learning and training approach appropriate to the needs of the trainees. 3. The initial training exercises are likely to be abstractions of the real job or situation rather than realistic segments of it. Try to achieve a balance between sufficient closeness to the real task to avoid distortion and sufficient distinctness to make transfer of learning easy. 4. Gradually add detail to the exercises until the trainee can deal with practical problems and realistic tasks.
For example	Traditional introduction might give a detailed account of first a milling machine and then a lathe. The Basic Concepts approach would deal with the behaviour of a cutting edge in general and then show how this applies to milling and turning.
Advantages	1. It helps the trainee to distinguish between essentials and inessentials. 2. It can be incorporated into other training methods. 3. It avoids over-detailed instruction at a stage when trainees have not yet acquired a basic understanding of the subject matter. 4. The trainee's understanding of a generalised skill or concept leads to more flexibility and greater ease of transfer.
Disadvantages	1. Like all effective training this method depends on a correct analysis of the skill or topic. Identification of features which are not basic to the job will prevent learning and performance improvement and result in confusion.

Further reading:
Ball, L. W. D. and Odel, A. L. (1963). A Pictorial Textbook of Engineering. London: Clover-Hume Press.

Ball, L. W. D. (1968). Chapter II in J. W. Barber (ed). Industrial Training Handbook. London: Illiffe

Toye, M. (1969). A re-think on basic skills. Industrial Training International, 4, 112–119

Training method 2. – Lecture, Video

Lecture	An oral presentation of specific subject matter which can convey information but may not be thought-provoking and is unlikely to alter the listener's opinions. This can be 'live' or on video.
Usual types of learning	Comprehension
Advantages	1. Can reach a large audience while taking comparatively little time to prepare and deliver. 2. Can be used in conjunction with discussion groups, question and answer sessions etc. 3. Can be used to present different sides of an argument, especially if a number of lecturers participate.
Disadvantages	1. Only about 20% of information is remembered after one week. 2. Lecturer's technique is important in conveying information effectively. 3. Does not encourage trainees to think for themselves or to develop decision-making skills. 4. Does not allow for individual differences among learners in their ability to learn. 5. Difficult for trainees to transfer learning from verbal description to new situation.

Further reading:

McLeish, J. (1968). The Lecture Method. Cambridge Monographs on Teaching Methods, No. 1 Cambridge Institute of Education

Powell, L. S. (1970). Lecturing to Large Groups. London: BACIE

Bligh, D. E. (1975). What's the use of lectures. Harmondsworth:

Broadwell, M. M. (1980). The lecture method of instruction: Englewood Cliffs, N. J.: Educational Technology

Training method 3. – Demonstration

Demonstration	A presentation which shows the trainees how to do something – usually a skill, or procedure. It is usually introduced by a short talk or lecture setting objectives for the session. The skill is then demonstrated by the trainer, with opportunities for questions from the trainees, and finally the trainees practise the skill or perform the exercise themselves.
Usual types of learning	Comprehension Reflex Procedure
Advantages	1. Involves several of the trainee's senses. 2. Provides time for practice. 3. Enables the trainer to identify individual difficulties during practice.
Disadvantages	1. Trainees may 'switch off' during demonstrations and therefore not be able to carry out the practice exercise. 2. Several members of a large group will not be able to see the demonstration properly.
Additional comments	The demonstration needs careful planning. The skill or exercise must be broken up into logical steps, perhaps using the basic skills or basic concepts methods. See also Discrimination method, Magnification method.

Further reading:

Ayres, R. (1977). Strategies in giving group instruction. In BACIE Journal, vol. 31, no. 7, July pp. 118–20

Ayres, R. (1977). A Trainer's Guide to Group Instruction. London: BACIE

Training method 4. – Case studies

Case study	A documented description of actual or imagined situations which is discussed by a group or written up by an individual. The trainee learns by his or her own analysis and solution of problems implicit in the case and from the instructor's comments on his or her response, usually after completion of the analysis.
Usual types of learning	Comprehension Attitude
Advantages	1. Trainee is usually actively involved. 2. Situations can be taken from the trainees' usual working environment.
Disadvantages	1. Initial preparation is costly and time consuming, although once prepared the method is cheap. 2. Participants need considerable verbal ability and often require preliminary training in planning, report writing etc before they can benefit fully. 3. The written description is not a form which is their normal working environment.
Additional comments	For this method to be flexible and usable for teaching general principles rather than a solution specific to the case, the instructor must be experienced. Attitudes seem unlikely to change as a result of one case study!

Further reading:

BACIE Case Studies (1970). London: BACIE

Belbin, E. and Belbin, R. M. (1970). Problems in Adult Retraining. London: Heinemann

Warren, M. W. (1969). Training for Results. Mass: Addison-Wesley

Reynolds, John, I. (1980). Case method in management development: guide for effective use. Geneva: ILO

Training methods 5 and 6. – Interactional Analysis, Role Play

Interactional analysis	A training method designed to develop specific, job-related, interpersonal skills e.g. interviewing, selling, managing group discussion. Behaviour is observed and feedback on its effectiveness is given to the trainee. It aims to make trainees aware of the behaviour of themselves and of others.
Role play	The method presents a real life or imagined practical situation to the trainee who deals with it as a real situation. The trainee and observers learn from the decisions and mistakes made. Both methods encourage the trainee to experiment with new behaviours.
Usual types of learning	Attitude Comprehension
Using interactional analysis	1. The trainee performs a task while his behaviour is observed and tallies are kept of the number of times each piece of behaviour appears. 2. A behaviour is typically described as: innovating seeking clarification supporting etc but the categories are completely flexible and are chosen according to the nature of the task. 3. Feedback by tally score or video is given to individuals or to the group. 4. Feedback is used to set behavioural objectives for the next exercise e.g. 'to double the amount of supporting behaviour'. 5. Behaviour is again recorded systematically so the trainees can measure their own progress.
Using role play	Role play is often combined with interactional analysis in order to provide more objective feedback, but it can be less formal than this. Both the role and the situation selected must be validated because there is a danger that the wrong type of behaviour may be learned. The effects of role play on the participants must be established before it becomes part of the training scheme.
Advantages	1. The training situation closely simulates the real job so learning of the specific skill can be easily transferred. 2. When interactional analysis is used the trainees' knowledge about their own social behaviour increases through systematic observation and feedback. 3. Understanding of the concepts should enable them to improve their own performance, if they choose to. 4. The ability to understand, analyse and respond to the behaviour of others is improved.

Disadvantages	1. Method can be expensive if several observers or computer feedback are required (although trainees can learn the observation skills to reduce this cost). 2. There is no evidence that the technique improves the social competences of trainees in contexts other than specific job-related social skills. 3. Both methods can be upsetting for learners.

Further reading

Maxwell Towers, H. (1969). Role-playing for Supervisors. Oxford: Pergamon

Pareek, V. (1967). Simulating reality: Role-playing. Training for Development. Richard D. Irwin and the Dorsey Press

Solem, A. R. (1960). Human Relations Training: Comparison of Case-Study and Role-playing. Personnel Administration, 23, 29–37

Nixon, K. (1973). Customer Contact Skills. Industrial and Commercial Training, 5, 8

Dyar, A. D. and Giles, W. J. (1974). Improving skills and working with People: Interaction Analysis. Training Information Paper 7. London: HMSO

Rackham, N, Honey, P. and Colber, M. J. (1971). Developing Interactive Skills. Guilsborough: Wellens

Training method 7.
– T-Group, Encounter Group

T-Group	A training group structured and planned to direct the attention of members to the ways in which people interact with each other in a social group. It aims to improve the general social skills of members by examining behaviour as it is actually happening i.e. trainees usually talk about their relationship with each other on the course.
Encounter group	A training group with aims similar to the T-group but more structured. It uses formal exercises which require group members to say or do something. The aim is to promote effective interaction with others by releasing tension, creating trust, increasing self-awareness and removing embarrassment.
Usual types of learning	Attitude
Additional comments	Although popular in the 1960s and 1970s, this type of training is now felt to be useful only in limited areas with the close guidance of trained instructors. Individuals may find the experience upsetting.

Further reading:

Smith, P. B. (1969). Improving skills in working with people: The T-group. TIP4. London: HMSO

Debersham, A. I. S. (1968). BACIE Training Manual No. 5. A Training Officer's guide to discussion leading. London: BACIE

Whitaker, F. P. G. (ed) (1965). T-Group Training. Oxford: Blackwell

Rogers, C. R. (1873). Encounter Groups. Harmondsworth: Penguin

Training methods 8, 9, 10, 11.
– Coverdale
Adventure Training
Team skills
Synectics

Common features	Most of these methods aim to achieve the following: 1. Encourage imagination e.g. for project teams or new product teams. 2. Develop appreciation of the differing but complementary and useful contributions of other team members. 3. Help the working relationships of individuals with varied talents and experience rather than backgrounds in the same functional area. 4. Resolve the conflict between the need to demonstrate personal abilities and the need for team achievement. 5. Develop individuals who are to be promoted to a position where they will need to take higher collective responsibility.
Usual types of learning	Attitude Comprehension
Coverdale	A specific form of group training which embodies well-established exercises and procedures designed to develop the individual by working in groups.
Adventure Training	Training run by Outward Bound centres and other outdoor centres uses challenging team activities previously untried by individuals (such as rock-climbing and pot-holing) to develop the individual within the group in leadership and effective management of people.
Team skills	This differentiates between an individual's functional/ specialist contribution to a team and his 'team role' shown in the style he or she adopts when working with others. Eight complementary team roles have been defined. Training aims to teach composition (and team-role patterns). It encourages individuals to employ the skills and techniques of the team roles to which they are temperamentally suited.
Synectics	This aims to enhance the creativity of a team by turning competitive energy within the team into co-operative energy. A process for generating innovative solutions to a problem is introduced and practised on the course.

Further reading

Radcliffe, P. J. and Keslake, P. S. (1981). 'Outward Bound?' in Boydell, T. and Pedler, M. (Eds). Management Self-Development Concepts and Practices, Aldershot. Gowan

Coverdale Training for Development (1967). London: Training Partnership

Belbin, R. M. (1981). Management Teams: Why they succeed or fail. London: Heinemann

Prince, G. M. (1982) in Shirley A. Olson (Ed): Group Planning and Problem Solving Methods in Engineering: Wiley

Training method 15.
– Mnemonics, Jingles

Mnemonic	An aid to remembering brief material, especially when it has to be remembered in a specific order. It usually takes the form of an easily remembered phrase or formula e.g. CRAMP (Comprehension, Reflex, Attitude, Memorising, Procedures)
Jingles	A common form of mnemonic e.g. 'Richard of York Gained Battles in Vain' lists in order the colours of the spectrum. Jingles are often used in a repetitive formula for advertising.
Usual types of learning	Memorising (Attitude in advertising?)
Advantages	1. Helps learner to deal with one specific topic or action e.g. "Mirror Signal Manoeuvre" when driving.
Disadvantages	1. Subject or action memorised is not readily transferable. 2. Material learned by this method is subject to interference by material learned earlier, later or at the same time i.e. the trainee may forget it.

Further reading:

Brown, Mark (1977). Memory Matters, Newton Abbot: David and Char

The Faber Book of Useful Verse (1981). Simon Brett (Ed). London: Faber and Faber

Training method 16.
– Rules, Deductive Method

Rules	Ways of dividing or structuring material into smaller sections to make memorising facts and figures easier. By using rules, the trainee is able to memorise less information. For example, a strategy for crossing the road is structured by rules which focus on the main aspects of the task! At the kerb, halt. Look right, look left, look right again, If all is clear, quick march.
Deductive method	A way of using one specific rule to reduce the trainee's memory load, useful when it cannot easily be structured or turned into a mnemonic. The material is categorised in groups so that something which does not belong to one group must be in the other. This reduces the amount of material to be learned by replacing some of the learning load with problem-solving or deduction. For example, instead of teaching a postal sorter the names of villages in Norfolk and in Essex, he or she can learn the Norfolk villages and deduce that any not recognised must be in Essex.
Usual types of learning	Memorising
Designing a rule	1. Analyse the task to ascertain which aspects can be subjected to a rule. 2. Formulate the rules and test them against different situations. 3. Check that they are systematic and that they can be learned and followed easily.

Further reading:
Belbin, E. (1964). Training the Adult Worker. Problems of Progression. Industry No. 15. London: HMSO

Belbin, E. and Downs, S. (1966). Teaching and Paired Associates: The Problem of Age. Occ. Psych. 40. 67–74

Training methods 17 and 18.
– Progressive Part method
Cumulative Part method

Progressive part method	A method used for teaching a task which consists mainly of skilled movements. The sequence of micro-motions is easy to get right but the task involves a heavy memory load. Breaking the task into parts does not destroy it.
Cumulative part method	A method used for teaching a task or material involving a lot of difficult memorising. It is particularly suitable when breaking the task into parts destroys or distorts it e.g. memorising a part in a play.
Usual types of learning	Memorising Reflex (Comprehension)
Steps in teaching progressive part method	1. Determine by analysis the actual skills used by experienced operators. 2. Divide the task into a sequence of separate parts. 3. Carry out special training for difficult or infrequent elements. 4. The trainees practice parts separately then in pairs, then linked together as shown below: A B A + B C B + C A + B + C 5. If speed is required, trainees practice each part against a target-time, then each sequence against the target. 6. Trainees continue practice until the correct pace and quality of work can be maintained for as long as the job requires.
Steps in learning by the cumulative part method	1. The task or learning material is broken up into easy stages, A, B, C, D . . . 2. Parts are learned in order but combined with parts learned previously so the trainee consolidates earlier learning while adding new learning. 3. The trainee cumulatively gains experience of various parts of the task and gets practice in linking the parts together: A A + B A + B + C A + B + C + D
Advantages	1. Both methods help the trainees to avoid fragmentary performance because they practise combining task elements. 2. Neither method assumes that the ability to do or remember parts of the task correctly is the same as the ability to do the whole task. 3. In both, demands on the trainee are increased gradually so that a constant rate of improvement can be maintained, and the material is not initially overwhelming.

Disadvantages	1. The trainee may associate 'learning by rote' with previous unpleasant educational experiences, and acquire a limited view of training. 2. Memorisation methods apply only to a specific task and are not easily transferred. They are often confused by material learned earlier or later.

Further reading:

Seymour, W. D. (1954). Industrial Training for Manual Operations. London: Pitman

Belbin, E. (1964). Training the Adult Worker. Problems of Progress in Industry. No. 15 London: HMSO

Training method 19.
– Drill and Practice and CBT Drill and Practice

Drill and Practice	This was for years the traditional way of teaching, particularly in schools. The instructor explains the principle underlying the exercise and the learners practise by doing examples. In the same way computer-based drill and practice gives practice on instruction that has taken place and does not usually present new instruction.
Usual types of learning	Memorising Comprehension Reflex
Advantages	1. The computer presents a question or problem, judges the response and gives immediate feedback to the learner. 2. Further problems are sequenced according to the correctness of the earlier answers so a learner can practice remedial exercises or move rapidly to more difficult problems. 3. The instructor can get immediate information on the learner's progress.
Disadvantages	1. Most appropriate for factual knowledge and fundamental concepts, not for reasoning or more complex problems.
Some applications	Product knowledge, principles of equipment operation or maintenance, administrative policies or procedures, safety regulations, learning basic facts and terminology.

Further reading:

Kearsley, G. (1983). Computer-based Training. A guide to selection and implementation. Addison-Wesley

Training method 20.
– Self and CBT Testing

Testing	Self-testing and rehearsal have been shown to be an efficient way of learning and particularly of memorising. Computer-generated tests allow each student to take a unique test depending on his/her performance. They are especially useful as pre-tests to determine what the learner needs to learn, and as post-tests on what has been learned.
Usual types of learning	Comprehension (Reflex) Memorising
Basic principles of CBT testing	Adaptive testing generates a number of test items of varying difficulty. These depend on either the learner's performance in the learning module or performance during the test. It is possible for a learner to receive high marks for correct answers to a large number of low-difficulty items or to a small number of high-difficulty items. The instructor's knowledge of the level achieved rather than the score enables progress to be monitored.
Advantages	1. The learner works at his or her own level of difficulty and therefore finds the work less frustrating. 2. Weiss (1979) showed that adaptive testing can measure achievement more precisely than conventional fixed-item tests, using 30–50% fewer test items.
Disadvantages	1. The learner may think his or her level of achievement is higher than it is and be falsely confident.

Further reading:

Elton, L. R. B. (1969). 'Student Feedback to Self-Testing in Innovations and Experiments in University Teaching Methods'. Proceedings of the Third Conference, University of London Teaching Methods Unit, April 1968

Weiss, D. J. (1979). Computerised Adaptive Achievement Testing. In Procedures for Instructional Systems Development (Ed) H. F. O'Neil. NY: Academic Press

Schultz, R. F. (1979). Computer Aids for developing Tests and Instruction. In Procedures for Instructional Systems Development (Ed) H. F. O'Neil. NY: Academic Press

Training methods 21 and 22. – Database Inquiry and Programming

Database Inquiry	This method teaches the learner how to use the computer database to look up information, solve problems and make decisions.
Programming	Trainers in computer training in the past often considered it necessary for a learner to know how to programme a computer in order to use it for learning.
Software Use	Programming skills are not required by most people. It is more useful to learn how to use software packages (e.g. editor, spreadsheet, database management system, plotting programme) and then to use these as aids to learning.
Usual types of learning	Comprehension
Advantages	1. The computer, database and software packages used on the job can be the learning resource, yet the principles learned are usually transferable. 2. This method is often combined with Embedded Training (Procedures 1 page 54)
Additional comments	The information on the database must be organised so that the learner can control and search it for different purposes.

Further reading:

Bork, A. (1971). Learning with Computers. Bedford, Mass: Digital Press

Training method 23. – CBT Tutorial

Tutorial	The CBT tutorial strategy is usually a discussion of a concept or procedure during which information is presented. Learning is monitored by questions interspersed in the discussion or by a test at the end.
Usual types of learning	Comprehension Reflex Attitude (Memorising)
Features of CBT tutorial	In a sense this is a training approach rather than a training method as many training methods can be used to present the material in the tutorial e.g. cueing and fading, graphics. Each piece of instruction is presented in a 'frame' which usually corresponds to a screen display. It is well-suited to administrative and clerical training which involve understanding of simple concepts and procedures.
Advantages	1. Advantages discussed in the section on CBT – a teaching approach apply to the tutorial method. 2. The tutorial method is extremely flexible and provides the opportunity for individualised instruction.

Further reading:

Al-Awar, J., Chaparis, A. and Ford, W. R. (March 1981). Tutorials for the first-time computer user. IEEE Transactions on Professional Communication 24 No. 1, 30–33

Steinberg, E. (1977). Review of Student Control in CAI. Journal of Computer Based Instruction 3. 84–90

Training method 24.
– CBT socratic tutorial

Socratic tutorial	This method is not yet commercially available as it is in the process of development. It involves a dialogue between the computer and the learner in natural (i.e. not computer) language. Either the learner or the computer can ask a question at any time.
Possible types of learning	Comprehension Reflex Attitude Memorising
Features	The prototype socratic tutorials show the learner asking questions which seek information and check understanding. The computer replies to the questions, and also inserts questions of its own to check areas of the learner's understanding when the learner's questions do not fit its programmed 'map' of information. As yet they are simplistic and usable only in sharply-defined areas such as electronics fault-finding. They require considerable computational power, which is not widely available in micro-computers. Progress is measured by the degree of comprehension or problem-solving skill demonstrated rather than by test scores.

Further reading:

Steerman, D. and Brown, J. S. (1982). Intelligent Tutoring Systems. New York: Academic Press

Kearsley, G. (1978). The Relevance of AI Research to CAI. J. of Educational Technology Systems 6, No. 3, 229–250

Training method 25.
– Simulation, Games

Simulations	Simulations present a model of a process, mechanism or activity. The trainee can alter the input or conditions and observe the change in output or outcome. In this way he is left to draw his own conclusions rather than to follow a previously designed sequence of instruction. Simulation uses 'real' time: events are not foreshortened.
Games	Games vary in that they usually have elements of competition (e.g. a time limit, an opponent) and of fantasy. The time of a game telescopes that experienced in real life.
Usual types of learning	Comprehension Reflex Attitude
Advantages	1. Games in particular are useful when trainee motivation is a problem. 2. Both Simulation and Games provide the learner with direct experience of complex problems. 3. Both can present a schematic or diagrammatic representation of equipment on which details are difficult to see e.g. faulty circuits in electronic components. 4. They are especially appropriate for teaching decision-making or problem-solving skills and are often used in sales or management training.
Disadvantages	1. Simulations and games do not present information. This must be gained through another method of instruction.
Additional comments	Simulation exercises and games are often used with a group of trainees who may act out different parts while a series of problems are introduced for them to solve.

Further reading:

Gibb, G. I. (1974). Handbook of Games and Simulation Exercises, London: E. and F. N. Spon Ltd.

Crawford, A. M. and Crawford, K. S. (1978). Simulation of Operational Equipment with a Computer-based Instructional system: A low-cost Training Technology. Human Factors 20: 145–158

Marti, H. and Voge, J. S. (1981). The Value of a Top Management Game in the Education of Production Engineers. In Computers and Education. Eds. R. Lewis and D. Tagg. Amsterdam: North Holland Publ.

Training method 26. – Simulators

Simulator	A device used to train learners to operate or maintain a particular piece of equipment (e.g. airplane, Apollo-landing craft, cigarette-rolling machine). The computer generates displays and the operation to be performed and the trainee responds to the displays. Feedback about the trainees performance can be given to both the trainee and the trainer.
Usual types of learning	Reflex Comprehension
Advantages	1. Trainee gains direct experience without using dangerous or costly equipment. 2. Development of computer-controlled video-disc systems has improved the interactive capabilities of simulators.
Additional comments	Traditionally simulators have been realistic, but research has shown that realism is not necessary for effective training. The trend now is towards simplified displays using computer graphics and 3D simulated control panels. Simulation (method 25) may replace simulators.

Further reading:

Adams, J. A. (1979). On the evaluation of training devices. Human Factors 21, 711–720

Blake, D. C. I. (1979). Visual Flight Rules (VFR). Control Tower Simulator. J. Educational Technology Systems 7 No. 1, 79–89

Training methods 27 and 28. – Discrimination method, Cueing and fading

Discrimination method	A method of teaching trainees to distinguish between closely similar items (e.g. quality control on a bottle production line). Usually a large number of points have to be checked. Computer quality control is likely to make a visual check obsolete.
Cueing and fading	Aids learning to discriminate on a small number of points by adding something e.g. a colour, label or pointer, to the item so that a trainee can see exactly what he has to look at or do. (e.g. colour coded keys on a typewriter). It can give advance warning of the occurrence and nature of an important feature so the trainee can get ready to deal with it.
Usual types of learning	Reflex Memorising
Steps in using the methods	1. Start with tasks which everyone will find easy e.g. an obvious difference between a good and a reject bottle. 2. Make subsequent discriminations gradually more difficult (and increase the speed if this is a feature of the job) until the standard required on the job is reached, or 3. Present successive objects to be sorted into groups or judged against standard items. 4. When using additional cues, gradually remove or 'fade' them. The timing of this is crucial as premature or over-rapid fading will disrupt learning.
Advantages	1. Learning is usually transferred easily to the job because the trainee does not rely on verbal description. 2. The trainee forms a concept of the quality required by practice in discriminating differences under conditions similar to the job. 3. Simple and relatively cheap.
Disadvantages	1. Visual discrimination is likely to become obsolete, although cueing and fading may remain a useful aid in teaching reflex skills.

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Training method 29.
– Magnification method

Magnification method	A method used for teaching skilled physical tasks which involve fine perceptual judgements rather than skilled bodily movements. The items are usually very small and difficult to see without training (e.g. pattern of a weave).
Usual types of learning	Reflex (Memorising)
Steps in using the methods	1. Identify the part of the task which is difficult for the trainee to master. (This is not easy to do.) 2. Highlight or increase in size the relevant part or feature. 3. Design exercises which enable the trainees to practice on the highlighted item. 4. Reduce the size, remove the highlights, increase the speed of the item or the extraneous distractions in the job progressively so that trainees gradually adjust to the features of the actual item.
Advantages	1. Training time is usually decreased. 2. Individual differences in final performance are often reduced. 3. Learning is transferred effectively to more difficult tasks.
Disadvantages	1. If the problematic features of the job are not identified correctly, learning will not take place.

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Procedural methods

Procedure 1. – Embedded training

Embedded training	This is an alternative to training for computer use. The term is used when a system or piece of equipment, (almost always computer-based) is self-training i.e. instructions for use are provided within the system.
Usual types of learning	(Comprehension) (Reflex) (Memorising) Procedures
Advantages	1. Embedded training can use any CBT training method. 2. It reduces the possibility of human error in complex or dangerous tasks. 3. When the memory load is difficult e.g. in airline reservation systems, it provides prompts when requested. 4. Embedded training is likely to become a standard feature of computer hardware and software.

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Procedure 2. – Job aids, check lists, simple instructions

Common features	These alternatives to training may be used when the procedure to be learned is simple and the employee can easily refer to relevant information during the task without becoming less efficient. If removing the aid would lead to serious errors, some training is needed.
Job Aids, Check lists	Cards, lists, manuals, posters etc which detail the steps to be taken to perform a task successfully. Instructions must be clear without training.
Computer-based job aids	These are useful if the task is so complex that an individual cannot be relied on to learn it, but can be trained to do it using a job aid. They can be in the form of prompts which recommend a number of options possible in the situation e.g. operation of a nuclear power plant where both the workload and the decisions to be made are complex and demanding.

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Procedure 3. – Complex instructions in audio-programme and algorithm form

Audio-programme	A tape-recorded programme is constructed from a method study and skills analysis of the task. This is played to the trainees over headphones while they are performing the task. It gives them clear standardised instructions which can be stopped and wound back if the trainee needs to repeat a sequence of actions or needs help from the instructor. They do not need to move from the workplace to get instructions. Training time is usually reduced and working efficiency is increased.
Algorithm (flow chart, decision-making)	A guide to decision-making for achieving a desired outcome. The chart presents conditions and issues which have to be taken into account as small, manageable steps set out systematically to guide the user through an otherwise complex decision. For example, a chart or algorithm is useful for fault analysis where the most effective strategies have been worked out beforehand. Research shows that most people tend to find the answer to a problem more quickly and accurately from an algorithm than from continuous prose. The original design analysis of the problem and design of the algorithm is crucial for success.

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